

2.1 limits

$$y = 3x^2 - 2x \quad \text{at } x_1 = 1 \quad y_1 = 1$$

$$x_2 = 1 + \Delta x \quad y_2 = 3(1 + \Delta x)^2 - 2(1 + \Delta x)$$

$$m_{\text{sec}} = \frac{[3(1 + \Delta x)^2 - 2(1 + \Delta x)] - 1}{\Delta x}$$

$$= \frac{3(1 + 2\Delta x + \Delta x^2) - 2 - 2\Delta x - 1}{\Delta x}$$

$$= \frac{\cancel{3} + 6\Delta x + 3\Delta x^2 - \cancel{2} - 2\Delta x - \cancel{1}}{\Delta x}$$

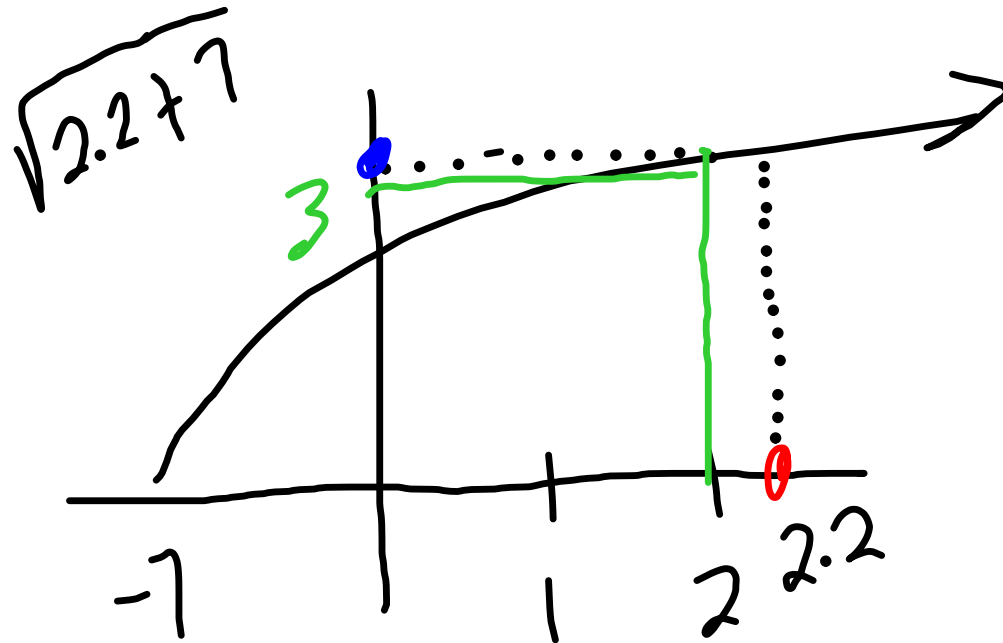
$$m_{\text{sec}} = \frac{4\Delta x + 3\Delta x^2}{\Delta x} = 4 + 3\Delta x$$

$$m_{\text{tan}} = \boxed{\lim_{\Delta x \rightarrow 0} 4 + 3\Delta x = 4}$$

$$\lim_{x \rightarrow 2} \sqrt{x+7} = 3$$

as  $x$  approaches 2,  $\sqrt{x+7}$  approaches 3

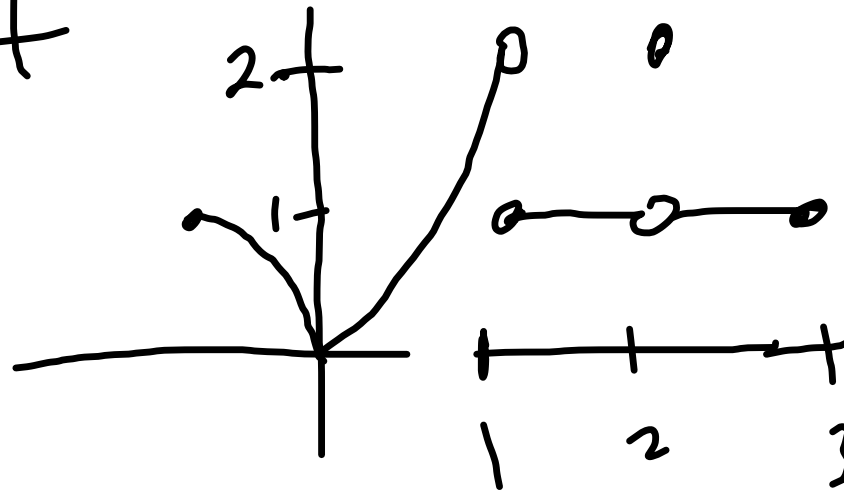
when  $x$  is close to 2,  $\sqrt{x+7}$  is close to 3



$$\lim_{x \rightarrow 2^+} \sqrt{x+7} = 3$$

right hand limit

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d  $\lim_{x \rightarrow 1^-} f(x) = 2$

e  $\lim_{x \rightarrow 1^+} f(x) = 1$

f  $\lim_{x \rightarrow 1} f(x)$  dne